

# IDAHO

## FISH & GAME DEPARTMENT

John R. Woodworth, Director

FEDERAL AID IN FISH AND WILDLIFE RESTORATION

JOB COMPLETION REPORT



Project F-53-R-5

LAKE AND RESERVOIR INVESTIGATIONS

Job No. 3. Squawfish Control in Anderson Ranch Reservoir

Job No. 4. Survival and Growth of Kokanee and Coho Salmon in Anderson  
Ranch Reservoir

By

Herbert A. Pollard II Fishery  
Biologist July, 1970

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State of Idaho

Project No. F-53-R-5

Job No. 3 and 4

Period Covered: March 1, 1969 to  
February 28, 1970

Name: LAKE AND RESERVOIR  
INVESTIGATIONS

Title: Squawfish Control and  
Survival and Growth of  
Kokanee and Coho Salmon  
in Anderson Ranch Reservoir

## **ABSTRACT:**

The research project at Anderson Ranch Reservoir continued in 1969. The two jobs of the project tested partial control of a squawfish population and evaluated game fish populations.

We observed squawfish spawning and fry emergence. Rotenone treatments of spawning areas killed many newly emerged squawfish fry.

An intensive creel census conducted at Anderson Ranch Reservoir from May :8 through November 1, 1969, yielded estimates of fisherman catch and effort. D u n g this period anglers fished 27,274 hours and caught 32,408 fish Boat anglers fished an estimated 19,940 hours and caught 23,11; fish consisting of 14.7 percent rainbow +rout, 8.4 percent kokanee, 3.3 percent coho, 71.9 percent squawt sh and 1.7 percent other species. Bank anglers during this same period fished 8,106 hours to catch 9,186 fish consisting of 27.0 percent rainbow trout, 0.1 percent kokanee, 0,9 percent coho, 55.6 percent squawfish and 16.4 percent other species.

Horizontal gill nets fished in the reservoir during September caught 85 percent rough fish. Vertical nets fished at the same time caught 65 percent game fish. The game fish occurred mostly at depths greater than 40 feet while rough fish more commonly occurred at lesser depths and coincident higher temperatures.

A kokanee run of approximately 15,000 spawned in the South Fork Boise River drainage above Anderson Ranch Reservoir in August and September.

Author: Herbert A. Pollard II  
Fishery Biologist

## **RECOMMENDATIONS**

This project should continue in its current form until the Department can thoroughly evaluate its various objectives.

## **INTRODUCTION:**

Anderson Ranch Reservoir lies on the South Fork Boise River in Elmore County, Idaho. The U. S. Bureau of Reclamation built the dam in the 1940's as one of three large reservoirs on the Boise River system for flood control, irrigation and power generation. At maximum level, the reservoir stands 4,196 feet above sea level and contains 493,000 acre feet of water. Maximum depth exceeds 300 feet. The reservoir measures 12 miles long with a shoreline of 44 miles. Steep rubble and sand make up the reservoir shoal area. Water level annually fluctuates about 30 feet.

In spite of its large size, Anderson Ranch Reservoir provides relatively little fishing. Squawfish abound in the reservoir. Squawfish provide a nuisance to fisherman and may compete for food and space with game fish. Important game fish species include rainbow trout, kokanee and coho salmon. Fishermen take Doily Vanden and yellow perch in small numbers.

The two jobs of this project concern squawfish control and game fish evaluation and improvement.

## **TECHNIQUES USED:**

### Creel Census

An intensive creel census conducted at Anderson Ranch Reservoir from May 18 through November 1, 1969 yielded estimates of total angler harvest, catch rates and catch composition including both game and rough fish.

We divided the 24-week season into two-week intervals. Project personnel conducted creel census on all four weekend days and two randomly selected weekdays per week for each two-week interval. We counted anglers at two-hour intervals or census days.

In an angler count, we traveled the length of the reservoir one-way by boat, counting all boat and bank anglers. On approximately one half of creel census days we made six counts, starting at 6:00 a.m., 8:00 a.m., 10:00 a.m., 2:00 p.m., 4:00 p.m., and 6:00 p.m. On other census days we made four counts at 8:00 a.m., 10:00 a.m., 2:00 p.m., and 4:00 p.m. We noted the percentage of effort occurring at 6:00 a.m. and 6:00 p.m. on six count days for each two-week interval. We used this figure to expand total counts on four count days to account for early morning and late evening fishermen.

We interviewed anglers during and between counts to determine number of hours fished and catch rates. We expanded average numbers of anglers per count and average catch rates to estimate total amount of angler effort and catch for Saturdays, Sundays, and weekdays in each two-week interval. We took length measurements and scale samples from kokanee and coho examined in creels to monitor growth.

### Species Composition

Project personnel sampled species composition of the reservoir during September with horizontal experimental gill nets as described in the 1966 Annual Progress Report F-53-R-2. We sampled each of the ten stations twice. We fished monofilament vertical gill nets similar to multifilament nets described in the 1966 report at the same station in the same manner as described in the 1966 report ( Figure 1).

### Age and Growth

We took length and scale samples from squawfish and kokanee that gill nets captured for comparison with samples of previous year.

### Population Control

As in previous years, we treated the shoreline of the reservoir with rotenone to kill newly emerged squawfish fry. We applied rotenone at a rate of ten gallons per mile of shoreline on July 16 and 17 and again on August 20 and 21.

### Life History Studies

We made observations on timing and duration of squawfish spawning and fry emergence to confirm earlier reports at Anderson Ranch Reservoir. We made underwater observations by snorkeling. We observed spawning adults from the bank and from a boat passing inshore. We dip-netted newly emergent fry for positive identification. We also sampled shallows of the South Fork Boise River above Anderson Ranch Reservoir for squawfish fry during the time of fry emergence in the reservoir and used prima-cord to collect adult squawfish in the river to check sexual development.

### Releases of Kokanee and Coho Salmon

The Department has released kokanee salmon fingerlings at Anderson Ranch Reservoir and the South Fork Boise River since 1964 (Table I), Spawning runs from these plantings have occurred annually since 1967. Coho salmon fingerling plants at Anderson Ranch Reservoir totaled 342,383; 351,330; and 357,200 in 1967, 1968, and 1969 respectively.

### Kokanee Runs

We expected kokanee runs of two separate stocks to make spawning runs in the South Fork Boise River System in 1969. We expected a run around August 20 and second run about September 10. We estimated run size in the South Fork Boise River by counting 23 one-tenth mile sections of the river and multiplying the average number of spawning fish per one-tenth mile by the length of river where kokanee spawned. Eagle Hatchery personnel erected a weir on Trinity Creek for spawn taking, and kept a rough count of fish passed up the creek.

## **FINDINGS:**

### Angling Pressure

More anglers at Anderson Ranch Reservoir fish from boats than from the bank (Tables 2 and 3). Heaviest fishing pressure occurs in early summer and pressure rapidly declines after July 4 (Figure 2). Heaviest daily fishing pressure occurs at midday. Boat angling activity peaked at the 10:00 a.m. count while bank angling activity peaked during the 2:00 p.m. count (Figures 3 and 4). About 40 percent of angling effort took place on weekdays. The remaining 60 percent split evenly between Saturdays and Sundays. (Table 4).

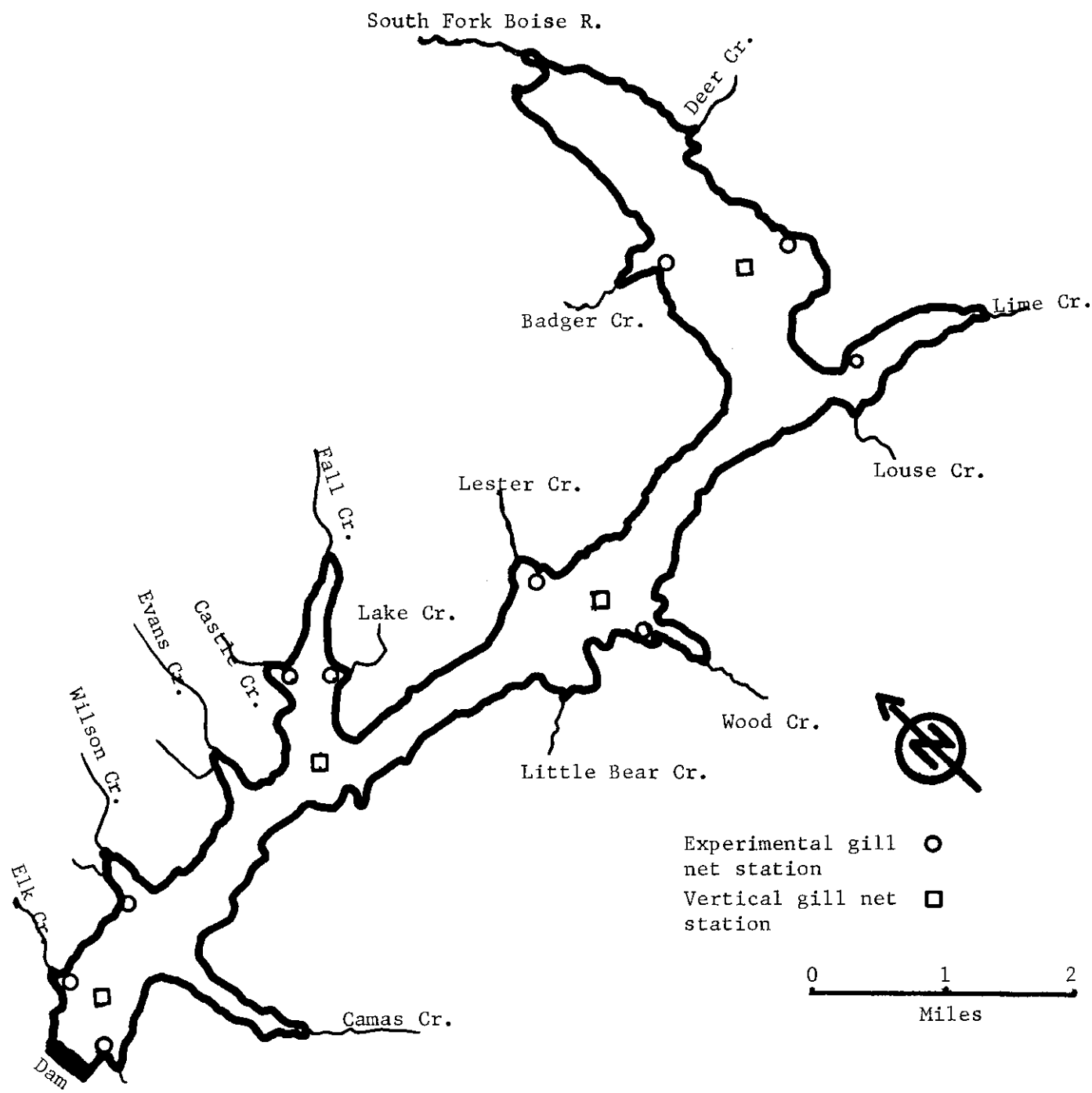


Fig. 1. Location of gill net stations at Anderson Ranch Reservoir, 1969.



Table 1. Kokanee Salmon Releases and Resultant Spawning Runs at Anderson Ranch Reservoir and the South Fork Boise River 1964-1969.

Planting date	Number and size of fish planted	Source of Parent Stock	Approximate Spawning Dates	Size and year of resultant spawning runs
11/30/64	686,000 fry	Island Park	8/10 - 9/20	6,000 1967
5/4/65	434,720 fingerling	Clark Fork	11/12 - 12/20	no estimate 1967
4/12/66	390,000 fingerling	Trout Lodge	9/10 - 11/20	15,000 1968
4/4/67	52,000 fingerling	Island Park	8/10 - 9/20	15,000 1969
4/26/67	156,000 fingerling	Trout Lodge	9/10 - 11/20	
4/8/68	75,000 fingerling	Trout Lodge	9/10 - 11/20	30-40 thousand 1970 many no doubt were wild fish from 1967 run
4/8/68	49,740 fingerling	Clark Fork	11/12 - 12/20	
4/ /69	122,500 fingerling	Trinity Creek <sup>1/</sup>	8/20 - 9/20	
4/ /70	200,000 "	"	" "	

<sup>1/</sup> Progeny of the 1968 run into Trinity Creek, originally of Trout Lodge stock. About 75 percent of these fish were fin-clipped (Adipsoe).

Table 2. Estimates of total hours fished and catch by boat anglers at Anderson Ranch Reservoir by two-week creel census periods from May 18 - November 1, 1969

Period	Inclusive dates	Estimated total hours fished	Estimated catch by species					Total
			Rainbow	Kokanee	Coho	Squawfish	Others	
I	5/18 - 5/31	2,207	640	44	110	1,655	4	2,453
II	6/1 - 6/14	2,554	612	51	25	2,324	25	3,237
III	6/15 - 6/28	1,496	434	105	15	1,376	47	1,977
IV	6/29 - 7/12	4,727	695	709	52	4,226	71	5,753
V	7/13 - 7/26	3,084	336	460	71	3,229	34	4,130
VI	7/27 - 8/9	1,050	121	61	16	921	16	1,135
VII	8/10 - 8/23	1,326	141	40	11	1,356	101	1,649
VIII	8/24 - 9/6	881	84	201	109	730	67	1,191
IX	9/7 - 9/20	456	41	148	26	260	6	481
X	9/21 - 10/5	520	126	52	210	342	12	742
XI	10/6 - 10/19	221	84	42	31	95	0	252
XII	10/20 - 11/1	418	77	33	94	104	3	311
	Total	18,940	3,391	1,946	770	16,618	386	23,111
	Fish per hour	<del>          </del>	.179	.103	.041	.877	.020	1.220
	Percent of catch		14.7	8.4	3.3	71.9	1.7	<i>m. 0</i>

Table 3, Estimates of total hours fished and catch by bank anglers at Anderson Ranch Reservoir by two-week creel census periods from May 18 - November 1, 1969

Period	Inclusive dates	Estimated total hours fished	Estimated catch by species					Total
			Rainbow	Kokanee	Coho	Squawfish	Others	
	5/18 - 5/31	1,359	122	0	54	625	394	1,195
II	6/1 - 6/14	1,448	478	0	0	1,072	290	1,840
III	6/15 - 6/28	733	147	0	8	301	117	573
IV	6/29 - 7/12.	890	146	0	5	376	208	735
V	7/13 - 7/26	773	188	0	0	397	21	606
VI	7/27 - 8/9	533	225	0	0	241	0	466
VII	8/10 - 8/23.	398	243	0	0	398	44	685
VIII	8/24 - 9/6	730	407	0	15	499	46	967
IX	9/7 - 9/20	605	205	0	0	636	258	1,099
X	9/21 - 10/5	436	218	10	5	296	104	633
XI	10/6 - 10/19	90	101	0	0	158	11	270
XII	10/20 - 11/1	III	0	0	0	104	13	117
Total			2,480	10	87	5,103	1,506	9,186
Fish per hour			.311	.001	.010	.612	.181	1.116
Percent of Catch			27.0	<0.1	0.9	55.6	16.4	

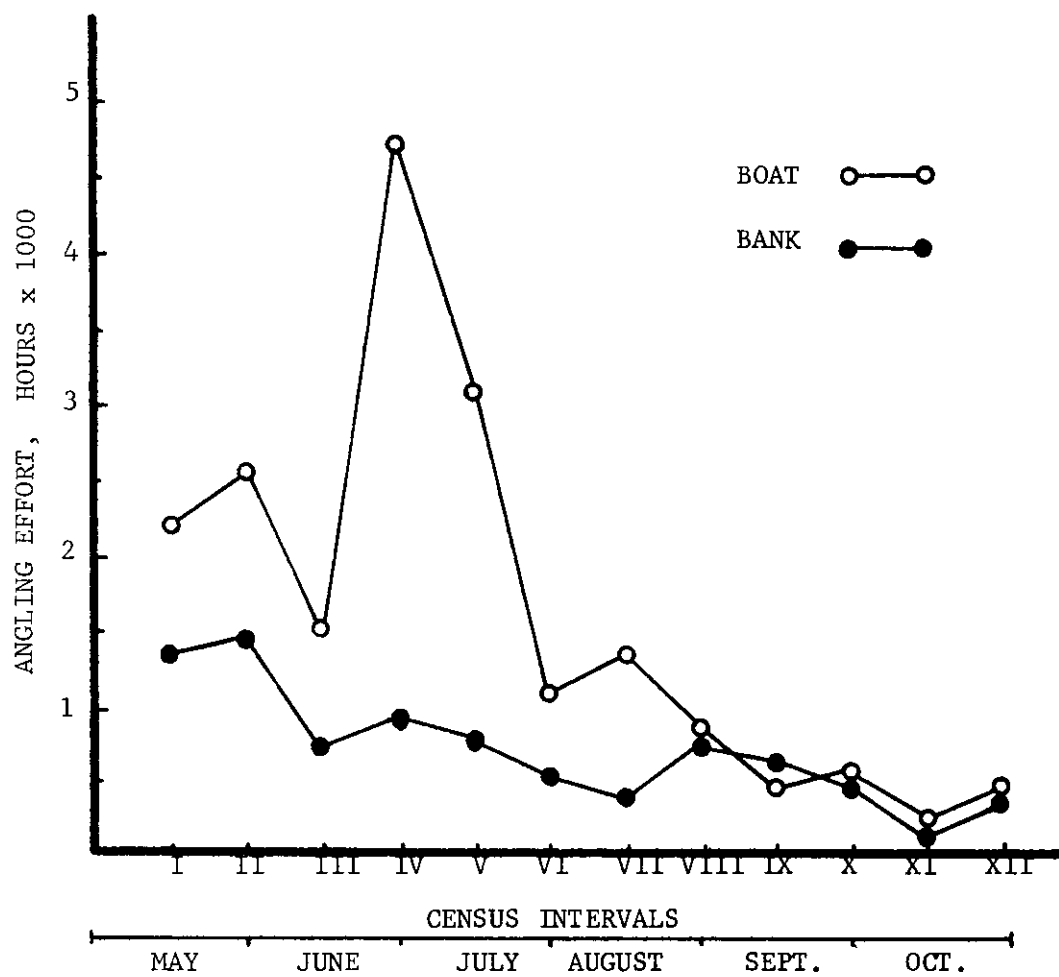


Figure 2. Seasonal distribution of boat and bank angler fishing effort at Anderson Ranch Reservoir during twelve two-week creel census intervals, May 18--November 1, 1969.

## Angler Harvest

Squawfish dominate the catch of both boat and bank fishermen, making up about 55 percent of the catch of bank anglers and 72 percent of the catch of boat anglers. (Tables 5 and 6). Both boat and bank anglers took rainbow trout next most commonly. Suckers, yellow perch, whitefish and Dolly Varden under the head "other species" make up the remainder of bank angler catch. Bank anglers rarely harvest kokanee or coho, but boat anglers take them third and fourth most commonly, respectively. Fish of other species made up a small portion of the boat angler take.

## Catch Rates

For boat anglers, squawfish catch rates increased early in the season, peaked during the spawning period and decreased rapidly after mid-August. Game fish catch rates for boat anglers declined in mid-summer and increased in August and September (Figure 5, Table 7). Bank anglers caught squawfish at an irregular rate which reached a high in October, as did rainbow trout catch rate (Figure 6, Table 8). The bank angler catch rate of "other species" decreased in mid-summer with peaks early and late in the season.

## Species Composition

Horizontal gill nets fished during September caught 85 percent rough fish, mostly squawfish, but including some chiselmouth chubs and coarsescale suckers. Mature kokanee, which roamed the shorelines looking for a place to spawn, made up the largest numbers of game fish caught in horizontal nets. Yellow perch, rainbow trout and coho salmon, in order of abundance, formed the remainder of game fish caught in horizontal nets (Table 9).

Water temperatures ranged from 65° to 70° F in the area where we fished horizontal nets, more in the temperature range preferred by rough fish species. Game fish, as shown by vertical gill net catch, prefer deeper, cooler water.

Game fish dominated the catch of vertical gill nets, but 80 percent of the fish caught at depths less than 40 feet consisted of squawfish. Kokanee made up over 60 percent of the total vertical gill net catch. We took 95 percent of kokanee and all rainbow trout and coho in nets at depths greater than 40 feet, and 70 percent of the squawfish at depths less than 40 feet. Temperatures ranged from 63° to 65°F between 0 and 40 feet deep and from 50° to 62°F between 40 and 100 feet (Tables 10 through 18.)

## Mesh Size Selectivity

The 2-inch stretch mesh vertical gill net caught the most fish of the six vertical nets (Table 19). The majority of common fish species in the reservoir measure 250 to 350 mm total length, the size range most readily caught in 2-inch mesh.

## Kokanee and Coho Age and Growth

Most coho apparently leave the reservoir in spill water in the spring following their planting. Fishermen take coho as 7 to 10 inch fish in the fall after planting and as 11 to 15 inch fish in the early spring, one year after planting. Coho are available to fishermen only for a short time in early and late fishing season when few anglers fish. Consequently relatively few of the 300,000 plus coho fingerlings planted annually find their way into the creel at Anderson Ranch Reservoir. Some

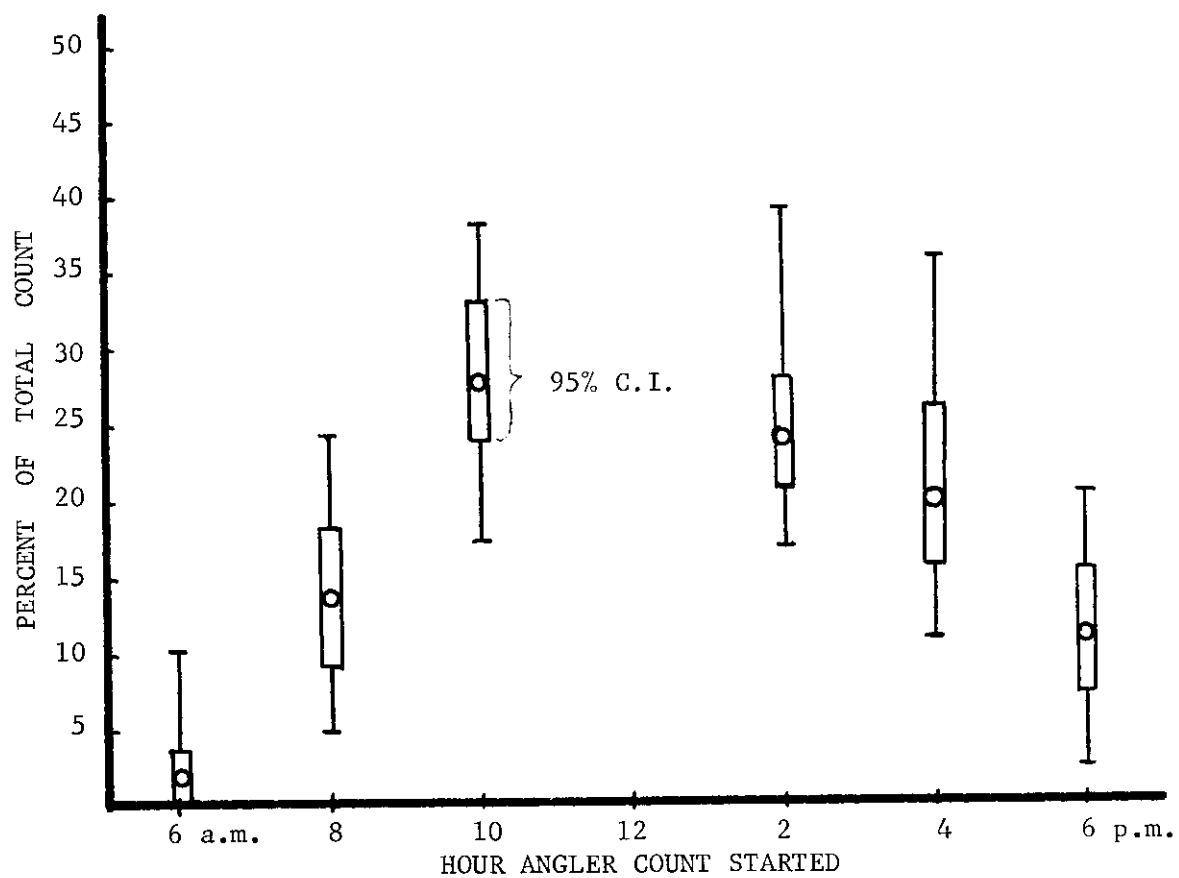


Figure 3. Mean percentage, range and 95% confidence interval of fishing effort by boat anglers in six counts made at two-hour intervals during creel census at Anderson Ranch Reservoir, May 18--November 1, 1969.

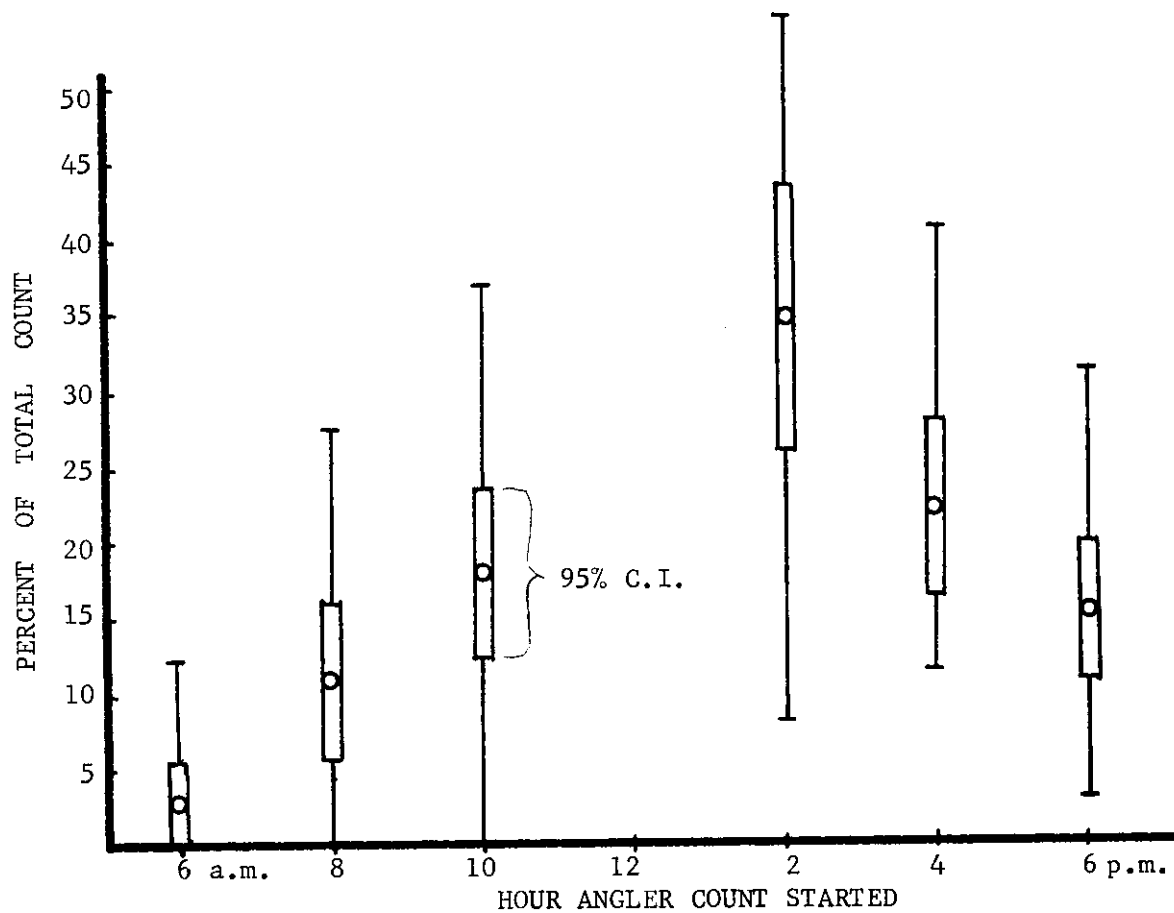


Figure 4. Mean percentage range and 95% confidence interval fishing effort by bank anglers in six counts made at two-hour intervals during creel census Anderson Ranch Reservoir, May 18--November 1, 1969.

Table 4. Weekly distribution of angler effort by day-class for two-week creel census intervals, Anderson Ranch Reservoir, 1969.

Interval	Percent of effort occurring per day-class		
	Saturdays	Sundays	Weekdays
Boat Anglers	39.9	30.7	29.5
II	32.2	27.7	40.1
III	26.7	59.9	13.4
IV	42.5	12.9	44.6
V	29.9	39.9	30.2
VI	42.0	37.0	21.0
VII	20.0	26.0	44.0
VIII	34.0	27.0	39.0
IX	23.7	50.0	26.3
X	34.2	21.5	44.2
XI	12.6	16.7	70.5
XII	14.6	16.2	69.2
Boat Angler Average	29.36	31.29	39.33
Bank Anglers	40.1	41.0	18.7
I	40.1	17.7	42.2
IV	24.0	54.9	21.1
V	38.4	21.1	40.5
VI	38.3	33.2	28.4
VII	33.0	31.0	36.0
VIII	44.0	32.8	23.2
IX	44.0	17.0	39.0
X	20.0	24.8	55.2
XI	23.4	35.3	41.3
XII	12.2	16.6	71.1
	26.0	6.6	64.4
Bank Angler Average	31.96	27.68	40.16
Combined Average	30.66	29.48	39.75



Table 5. Percentage composition of boat angler catch at Anderson Ranch Reservoir by two-week creel census periods, May 18 - Nov. 1, 1969.

Period	Rainbow	Kokanee	Coho	Squawfish	Others
I	26.3	2.0	4.0	67.3	0.2
II	20.0	1.7	0.9	76.5	0.9
III	21.8	5.0	0.1	70.1	2.3
IV	12.0	12.3	0.9	73.4	1.2
V	8.1	11.2	1.7	78.3	0.8
VI	10.6	5.3	1.4	81.2	1.4
VII	8.5	2.4	0.6	82.3	6.1
VIII	7.0	16.9	9.1	61.3	5.6
IX	8.3	30.7	5.1	53.9	1.4
X	15.9	6.5	26.5	42.9	2.4
XI	33.3	16.6	12.5	37.5	0.0
XII	24.7	10.8	30.1	33.1	1.1
All periods combined average	14.7	8.4	3.3	71.9	1.7

Table 6. Percentage composition of bank angler catch at Anderson Ranch Reservoir by two-week creel census periods, May 18 - Nov. 1, 1969.

Period	Inclusive dates	Rainbow	Kokanee	Coho	Squawfish	Others
		10.0	00.0	4.4	52.2	33.3
	5/18 - 5/31					
II	6/1 - 6/14	25.9	00.0	00.0	58.6	15.4
	6/15 - 6/28	25.8	00.0	1.7	52.5	20.0
IV	6/29 - 7/12	19.9	00.0	00.6	51.2	28.3
V	7/13 - 7/26	31.0	00.0	00.0	65.5	3.4
VI	7/27 - 8/9	48.2	00.0	00.0	51.8	00.0
VII	8/10 - 8/23	35.8	00.0	00.0	57.9	6.3
VIII	8/24 - 9/6	42.1	00.0	1.6	51.6	4.8
IX	9/7 - 9/20	18.9	00.0	00.0	58.7	23.8
X	9/21 - 10/5	34.4	1.6	00.8	46.7	16.4
XI	10/6 - 10/19	37.5	00.0	00.0	58.3	4.1
XII	10/20 - 11/1	48.6	00.0	00.0	45.7	5.7
		27.9		0.9	54.9	16.2
All periods	combined average		<0.1			

Table 7. Catch rates in fish per hour of boat anglers at Anderson Ranch Reservoir by two-week creel census periods, May 18 - Nov. 1, 1969

Two-Week Interval	Beginning Date	Rainbow	Kokanee	Coho	Squawfish	Others
	May 18	.295	.021	.047	.754	.002
	June 1	.241	.025	.009	.910	.010
III	June 15	.289	.067	.010	.920	.030
IV	June 29	.147	.150	.011	.894	.015
V	June 13	.109	.149	.023	1.047	.011
VI	July 27	.115	.058	.015	.877	.015
VII	August 10	.106	.030	.008	1.023	.076
VIII	August 24	.095	.229	.124	.829	.076
IX	Sept. 7	.089	.325	.059	.571	.014
X	Sept. 21	.243	.099	.405	.658	.024
XI	Oct. 6	.380	.140	.142	.428	.000
XII	Oct. 20	.184	.080	.224	.248	.008
All	period combined average	.179	.103	.041	.877	.020

Table 8. Catch rates in fish per hour of bank anglers at Anderson Ranch Reservoir by two-week creel census intervals, May 18 - November 1, 1969.

Two-Week Interval	Beginning Date	Rainbow trout	Kokanee	Coho	Squawfish	Others
I	May 18	.088	.000	.040	.459	.292
II	June 1	.333	.000	.000	.740	.200
III	June 15	.204	.000	.010	.415	.160
IV	June 29	.164	.000	.005	.423	.234
V	July 13	.243	.000	.000	.514	.027
VI	July 27	.422	.000	.000	.453	.000
VII	August 10	.610	.000	.000	1.000	.110
VIII	August 23	.557	.000	.021	.684	.063
IX	Sept. 7	.339	.000	.000	1.052	.426
X	Sept. 21	.500	.024	.012	.679	.238
XI	Oct. 6	1.125	.000	.000	1.750	.125
XII	Oct. 20	.327	.000	.000	.308	.038
All period combined average		.311	.001	.010	.612	.181

Table 9. Species composition of the catch of experimental gill nets fished at 10 sampling stations, two sets per station, Anderson Ranch Reservoir, September 4 - 8, 1969. (19 hours per set, 380 total hours fished).

Location	Date set	Species Captured								Total
		SQ	CM	YP	CSS	SH	RBT	KOK	Coho	
Badger Creek Bay	September 4	68	11	1	1	0	3	14	0	90
Perch Point	"	87	2	21	12	0	0	2	0	124
Lime Creek Bay	"	47	6	1	6	0	2	6	0	68
Lester Creek Bay	"	23	0	0	1	0	0	3	0	27
Wilson Creek Bay	September 5	31	7	0	0	0	1	1	0	40
Castle Creek Bay	"	56	6	3	9	0	2	8	0	84
Lake Creek Bay	"	59	2	5	2	0	3	2	0	73
Wood Creek Bay	"	62	6	2	2	0	0	3	0	75
Elk Creek Bay	September 6	45	3	0	1	1	3	2	0	55
Dam Forebay	"	34	6	0	0	0	3	3	1	47
Wilson Creek Bay	"	27	3	0	0	0	1	1	0	32
Lake Creek Bay	"	37	2	2	1	0	1	3	0	46
Elk Creek Bay	September 7	56	17	7	1	2	1	6	0	90
Dam Forebay	"	72	3	7	3	0	3	3	0	91
Castle Creek Bay	"	45	7	2	1	0	2	3	0	60
Lester Creek Bay	"	46	5	0	4	0	1	7	1	64
Badger Creek Bay	September 8	74	14	28	4	0	1	22	0	146
Perch Point	"	82	7	12	18	0	1	11	0	131
Lime Creek Bay	"	73	7	0	17	0	0	8	0	105
Wood Creek Bay	"	89	0	3	13	0	2	2	0	109
Total		1113	114	91	96	3	33	110	2	1562
Percent of Total		71.2	7.2	5.8	6.1	.1	2.1	7.0	.1	
Catch per hour		2.93	0.30	0.24	0.25	<0.10	<0.10	0.29	<0.10	4.11

SQ - Squawfish  
 CM - Chiselmouth  
 YP - Yellow perch  
 CSS - Coarsescale sucker

SH - Redside shiner  
 RBT - Rainbow trout  
 KOK - Kokanee

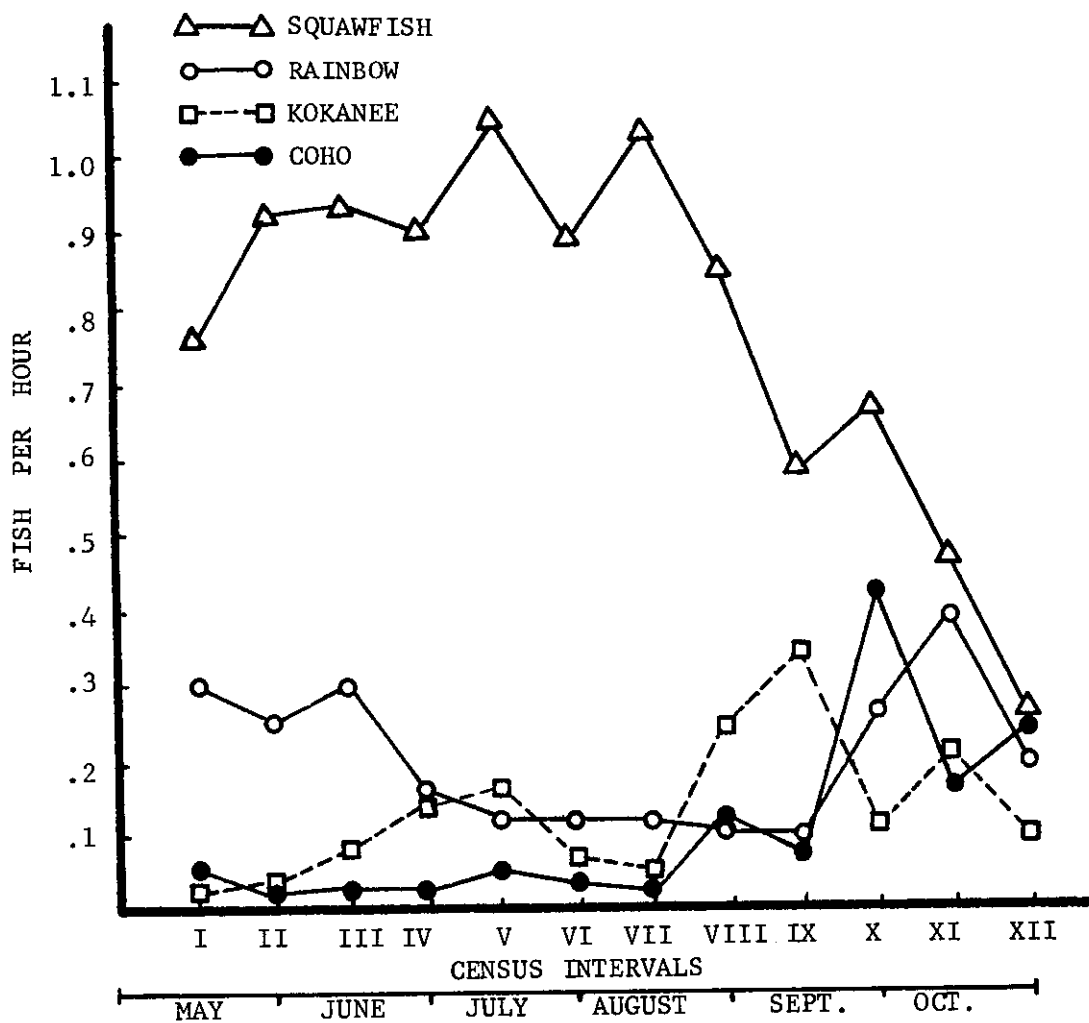


Figure 5. Catch rates of principal fish species by boat anglers at Anderson Ranch Reservoir by two-week creel census intervals May 1--November 1, 1969.

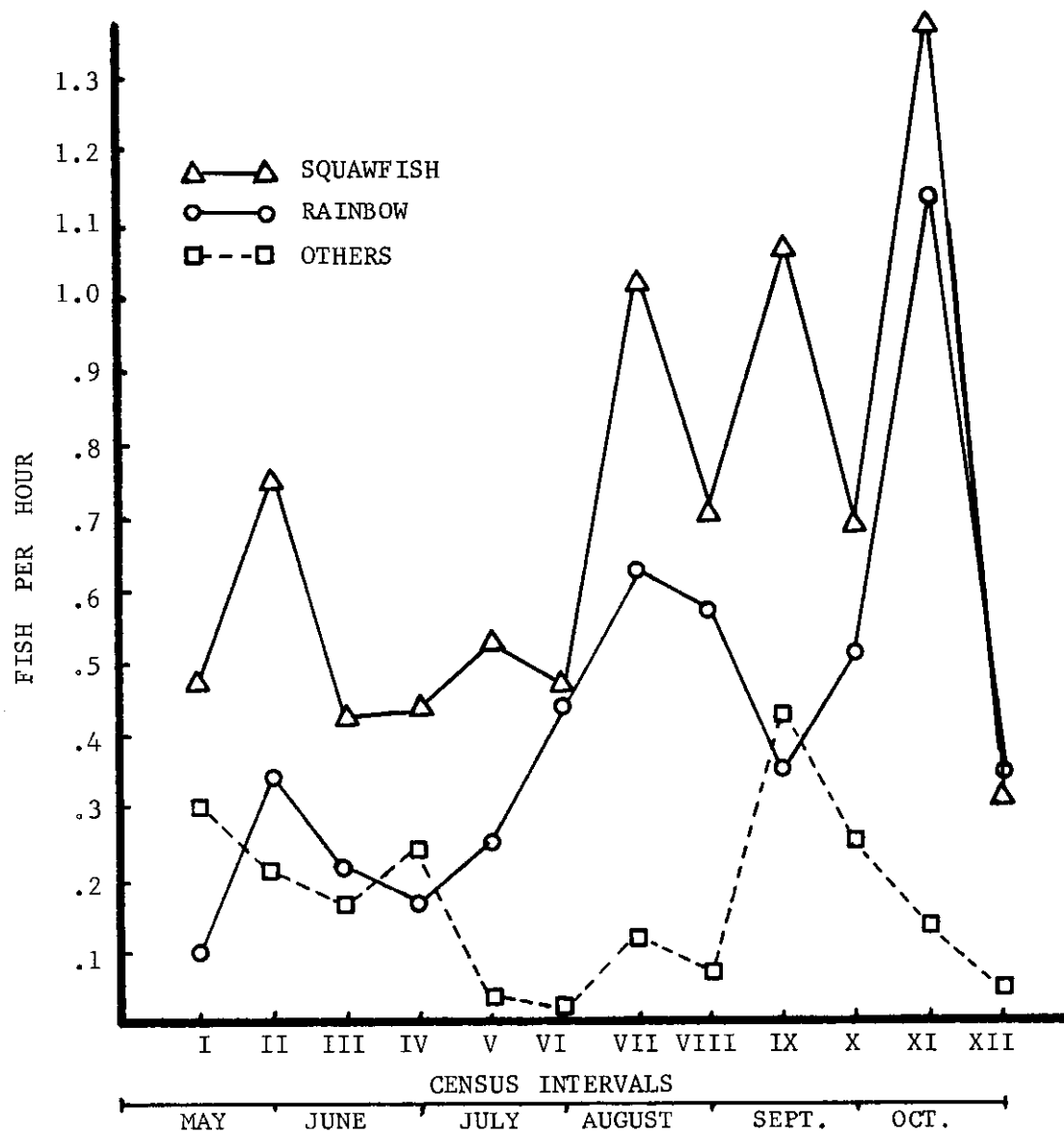


Figure 6. Catch rates of principal fish species by bank anglers at Anderson Ranch Reservoir by two-week creel census intervals May 18--November 1, 1969.

Table 10. Species composition, vertical temperature profile, and depth distribution of fish captured in 48 vertical gill net sets at Anderson Ranch Reservoir, September 15 - 25, 1969.

Temperature data		Vertical Distribution (ft.)	Species Captured						
Dpth (ft.)	Temperature (°F)		SO	CSS	RBT	KOK	COHO	CMC	MWF
0	64-65	0-10	61	1	0	2	0	1	0
10	64-65	10-20	7	1	0	2	0	0	0
20	64-65	20-30	12	0	0	7	0	0	0
30	64-65	30-40	6	1	0	5	0	1	0
40	63-65	40-50	3	5	1	22	3	0	0
50	58-62	50-60	6	1	0	57	2	0	0
60	55-56	60-70	5	3	1	60	6	0	0
70	53-54	70-80	10	6	0	54	4	0	0
80	51-52	80-90	2	9	0	44	5	0	0
90	50-52	90-100	6	10	0	25	0	0	1
100	50-51	Totals	118	37	2	278	20	2	1
		Percent total	26.4	8.0	<1	60.3	4.1	<1	<1



Table II. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in mid-reservoir near Wood-Loster Creek, Anderson Ranch Reservoir, September 16, 1969

Temperature Data		Vertical Distribution	(ft.)	Species Captured		
Depth	(ft.)			Squawfish	Rainbow	Kokanee
0	64	0-10		5	0	0
10	65	10-20		0	0	0
20	65	20-30		0	0	0
30	64	30-40		2	0	0
40	64	40-50		0	1	2
50	58	50-60		1	0	2
60	55	60-70		0	0	5
70	53	70-80		0	0	4
80	51	80-90		0	0	0
90	50	90-100		0	0	0
100	50			8	1	13

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Table 12. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in mid-reservoir near Perch Point, Anderson Ranch Reservoir, September 15, 1969

Temperature Data		Vertical Distribution	(ft.)	Species Captured				
Depth	(ft.)			Squawfish	C.S.	Sucker	Kokanee	Coho
0	64	0-10		13	0		1	0
10	64	10-20		1	1		0	0
20	64	20-30		2	0		5	0
30	64	30-40		2	1		2	0
40	64	40-50		0	3		4	0
50	58	50-60		1	1		11	0
60	56	60-70		2	0		10	1
70	54	70-80		1	3		11	1
80	52	80-90		0	4		3	0
90	51	90-100			7			0
100	50			23	20		48	2

Table 13. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in mid-reservoir near Fall Creek Bay, Anderson Ranch Reservoir, Sept. 23, 1969.

Temperature Data		Vertical Distribution	(ft.)	Species Captured		
Depth	(ft.)			Squawfish	Kokanee	Whitefish
0	64	0-10		9	1	0
10	65	10-20		1	1	0
20	65	20-30		1	0	0
30	64	30-40		2	1	0
40	64	40-50		1	3	0
50	61	50-60		0	7	0
60	55	60-70		0	18	0
70	54	70-80		3	8	0
80	52	80-90		0	16	0
90	51	90-100		4	13	1
100	51	Totals		21	68	

Table 14. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in the forebay of Anderson Ranch Reservoir, September 24, 1969

Temperature Data		Vertical Distribution	(ft.)	Species Captured			
Depth	(ft.)			Squawfish	Rainbow	Kokanee	Coho
0	65	0-10		8	0	0	0
10	64	10-20		0	0	0	0
20	64	20-30		0	0	0	0
30	64	30-40		0	0	0	0
40	64	40-50		1	0	0	0
50	59	50-60		1	0	5	0
60	57	60-70		1	1	5	1
70	55	70-80		1	0	2	1
80	53	80-90		2	0	6	2
90	51	90-100		0	0		0
100	51	Totals		14	1	19	4

Table 15, Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in mid-reservoir near Dam Forebay, Anderson Ranch Reservoir, Sept. 18, 1969.

Temperature Data			Vertical Distribution (ft.)	Species Captured		
Depth (ft.)	Temperature (°F.)			Squawfish	Kokanee	Coho
0	63		0-10	4	0	0
10	63		10-20	1	0	0
20	63		20-30	2	0	0
30	63		30-40	0	1	0
40	63		40-50	1	3	0
50	62		50-60	2	5	2
60	56		60-70	2	3	4
70	54		70-80	0	0	0
80	52		80-90	0	6	2
90	52		90-100	0	3	0
100	51			12	30	8

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Table 16. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in mid-reservoir near Fall Creek, Anderson Ranch Reservoir, September 17, 1969.

Temperature Data			Vertical Distribution (ft.)	Species Captured		
Depth (ft.)	Temperature (°F.)			Squawfish	Kokanee	Coho
0	64		0-10	3	0	0
10	64		10-20	1	0	0
20	64		20-30	4	2	0
30	64		30-40	0	1	0
40	64		40-50	0	2	3
50	59		50-60	1	10	0
60	56		60-70	0	8	
70	54		70-80	1	7	0
80	52		80-90	0	10	
90	51		90-100	0	5	0
100	50			10	45	5

Table 17. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in mid-reservoir near Lester-Wood Creek, Anderson Ranch Reservoir, September 22, 1969

Temperature Data			Vertical Distribution	(ft.)	Species Captured			
Depth	(ft.)	Temperature	(°F.)		Squawfish	C.S. Sucker	Kokanee	Chiselmouth
0		63		0-10	7	0	0	1
10		64		10-20	3	0	0	0
20		64		20-30	3	0	0	0
30		64		30-40	2	0	0	1
40		64		40-50	0	0	4	0
50		62		50-60	0	0	8	0
60		56		60-70	0	0	1	0
70		54		70-80	3	1	4	0
80		52		80-90	0	2	2	0
90		52		90-100		0	0	0
100		50			19	3	19	2

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Table 18. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in mid-reservoir near Perch Point, Anderson Ranch Reservoir, September 25, 1969

Temperature Data			Vertical Distribution	(ft.)	Species Captured			
Depth	(ft.)	Temperature	(°F.)		Squawfish	C. S. Sucker	Kokanee	Coho
0		64		0-10	12	1	0	0
10		64		10-20	0	0	1	0
20		64		20-30	0	0	0	0
30		64		30-40	0	0	0	0
40		64		40-50	0	2	4	0
50		58		50-60	0	0	9	0
60		56		60-70	0	1	11	0
70		54		70-80	1	2	9	1
80		53		80-90	0	3	1	0
90		52		90-100	0	3	1	0
100		51			13	12	36	1

Table 19. Mesh size selectivity of vertical gill nets fished at four mid-reservoir sites in Anderson Ranch Reservoir, September 15 - 25, 1969.

Species	Number of fish caught by each net (mesh size, stretch measure, inches)						Total
	1	1 1/2	2	2 1/2	3	4	
Squawfish	9	17	58	33	2	2	122
Coarsescale sucker	0	1	1	8	24	3	37
Rainbow trout	1	0	1	0	0	0	2
Kokanee	67	33	116	43	11	8	278
Coho	4	11	3	1	0	1	20
Chiselmouth	1	0	1	0	0	0	2
Total	82	62	180	85	37	14	467
Percent total	17.5	13.2	38.4	18.1	7.1	3.0	100.0

of the coho enter the fishery of the river and reservoirs below Anderson Ranch Dam.

We could never collect enough coho simultaneously to provide an adequate sample to describe coho lengths in terms of mean or modal size at any age or growth stage.

Only squawfish exceed kokanee in net catches and only rainbow trout exceed kokanee in game fish catch of sport anglers. Kokanee occur in the reservoir in three age classes. They spawn and die at the end of their third year. Fishermen take kokanee from the time the fish reach eight inches in their second year until they assume spawning characteristics and stop feeding late in their third year.

Figure 7 shows the length frequency distribution of 200 kokanee taken in gill nets in September, 1969. Age I fish make up the central portion of the distribution. Age II fish which have not yet spawned make up the right-hand tail of the distribution. The left-hand tail of the distribution consists of age 0 fish which for the most part had yet to grow large enough for the nets to retain.

### Squawfish Age and Growth

I plotted lengths of 304 squawfish taken in gill nets in September in a length frequency distribution by 10 mm size groups (Figure 8). The chart shows a modal length of 310 mm. Scales from several fish in each area of the distribution indicate that the sample consists of three age classes: age class II, modal length 210 mm; age class III, modal length 270 mm; and age class IV, modal length 310 mm.

### Population Control

Project personnel treated the shoreline of the reservoir with rotenone about two weeks after squawfish first appeared. We repeated the treatments one month later. Large numbers of squawfish fry and fingerlings succumbed to the rotenone. Attempts to estimate the numbers of fish killed by counting dead fish along selected sections of shoreline failed because gulls, mergansers and herons moved into treated areas and cleaned up many of the dead fish before they floated ashore. In treated areas we counted approximately twice as many dead squawfish fingerlings of year class 1967 as of year class 1968. These counts may indicate that the double rotenone treatment of 1968, coupled with early drawdown in 1968 killed fish more effectively than the single rotenone treatment in 1967. (F-53-R-3 and 4).

Some adult squawfish, suckers, yellow perch and shiners succumbed to rotenone treatments. We found only about 40 rainbow trout and 1 coho salmon fingerling killed near mouths of tributary streams.

### Squawfish Life History

We first observed concentrations of squawfish along shorelines on June 20. We saw the first newly emerged fry near the pine airstrip on July 3. At the time of the first rotenone treatment (July 16 and 17), large concentrations of spawning squawfish spread around the shoreline of the reservoir. By August 10, large concentrations of squawfish had disappeared but some female squawfish taken in gill nets still carried eggs. Judging from these observations, I conclude that the squawfish spawning period extends at least 60 days, from about June 20 to August 20, peaking about July 15.

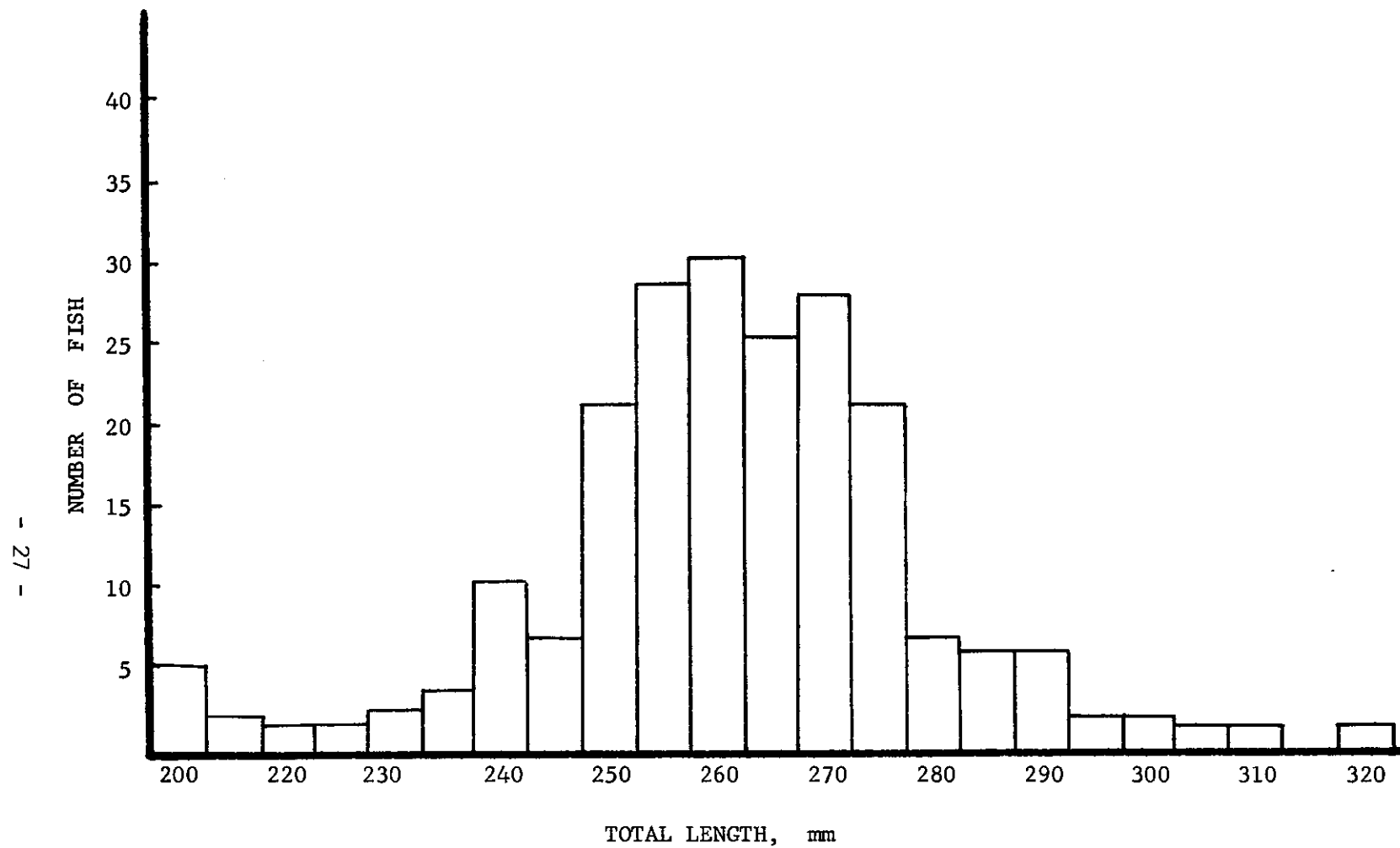


Figure 7. Length frequency distribution of 200 kokanee caught in vertical gill nets at Anderson Rancy Reservoir, September, 1969.

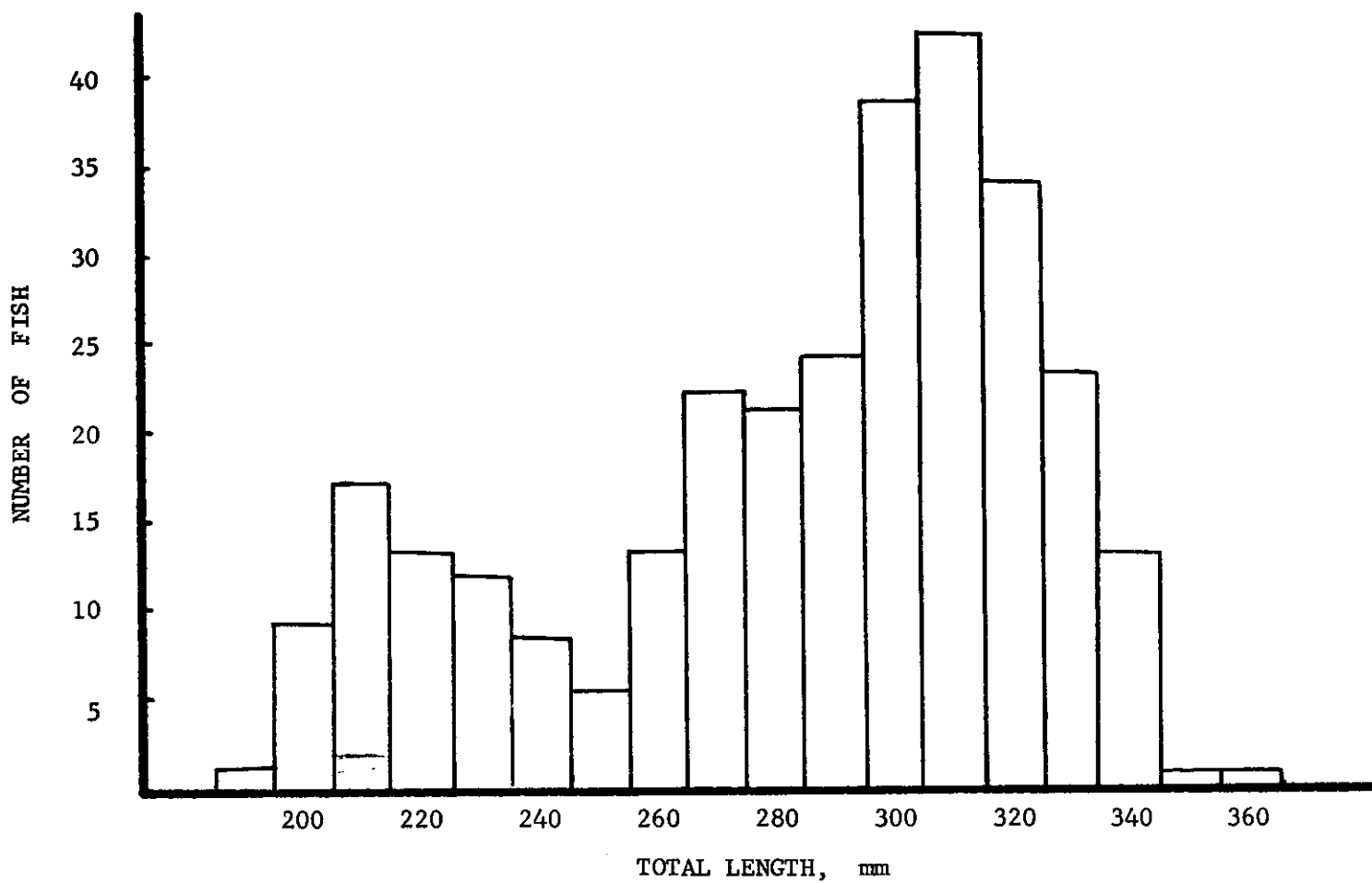


Figure 8. Length frequency distribution of 304 squawfish caught in experimental gill nets at Anderson Ranch Reservoir, September, 1969.



During July, repeated dip-net sampling of fry in shallows of the South Fork Boise River above the reservoir turned up no squawfish. Primacord samples in the river yielded no mature fish.

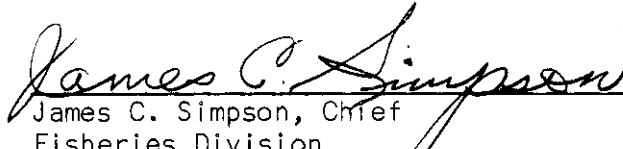
#### Kokanee Spawning Runs

Kokanee appeared in the South Fork Boise River above Anderson Ranch Reservoir during the last week of August. On September 16 an estimated 10,000 to 12,000 fish had passed up Trinity Creek and between 2,000 and 3,000 fish remained in the main river. Gill nets in the reservoir at this time caught kokanee in spawning condition. Although fish in this spawning run came from two separate genetic stocks, we noted no apparent timing difference in runs. Fish entered the river continuously from August 25 through September. The earlier run probably overlapped with later running fish around September 15. By mid-October, few live kokanee remained in the river and on November 1, I observed no live kokanee.

A small run of kokanee occurred in the short section of Fall Creek between the reservoir and the road culvert. One group of about 75 fish spawned around the tenth of September and a later group of about 200 fish spawned around October 20.

Submitted by:  
Approved by: Herbert A.  
Pollard II Fishery Biologist

  
John R. Woodworth, Director

  
James C. Simpson, Chief  
Fisheries Division

  
Vernon B. Rich, Coordinator